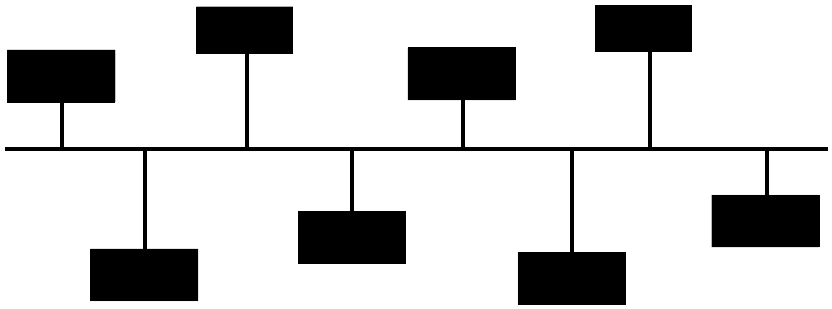
QDC-400

CINENET™



Operation and Installation Manual

STRONG
Cinema Products

Revision 2.00
June 2005

QDC-400
Installation, Setup and Operation Manual

PR005 Revision 2.00

This manual covers the setup and operation of the QDC Quad Dimmer Controller..

Optional CineNet and related equipment is covered in the following product reference manuals:

- PR001 CNA Installation Manual
- PR002 CNA-200 Setup and Operation Manual
- PR003 CNA-150 Setup and Operation Manual
- PR004 CNA-100 Setup and Operation Manual
- PR005 QDC-400 Installation and Setup Manual
- PR006 ACP-50 Installation and Setup Manual
- PR007 RVC-5 Installation and Setup Manual
- PR008 PCI-64 Gateway Interface Installation
- PR009 CineNet Host Software
- PR010 RCM-10/RSM-10/RSM-20 Installation and Operation Manual
- PR011 Strong Dimmer Installation, Setup, and Operation Manual
- PR012 eCNA-100 Automation Manual
- PR013 eCNA-150 Automation Manual
- PR014 eCNA-200 Automation Manual
- PR016 Strong FP350 Installation and Operation Manual
- PR017 Eprad FP350 Installation and Operation Manual
- PR018 Paging system Setup and Installation Manual
- PR019 VNC Setup and Operation Manual
- PR020 CineSuite Installation and Operation Manual

Warranty

CineNet automation products, sold by STRONG INTERNATIONAL, are warranted against defects in materials and workmanship for one year from the date of purchase. There are no other express or implied warranties and no warranty of merchantability or fitness for a particular purpose.

During the warranty period, STRONG INTERNATIONAL will repair or, at its option, replace components that prove to be defective, provided the unit is shipped prepaid to the manufacturer directly or via and authorized distributor. Not covered by this warranty are defects caused by modification, misuse or accidents and any further damage caused by inadequate packing for service return.

STRONG INTERNATIONAL's obligation is restricted to the repair or replacement of defective parts and under no circumstances will STRONG INTERNATIONAL be liable for any other damage, either direct or consequential.

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Operation

Introduction - Light Control System

The CNA Light Control System is used to create custom lighting effects in the theatre auditorium. The system is based on the QDC-400 control board and the DPM-2KW 2000 watt power modules. The QDC-400 is a 4 channel dimmer controller that can drive up to two DPM-2KW power modules per channel. The CNA automation can drive up to four QDC-400 control boards for a total of 16 channels. The CNA automations currently support two lighting zones that can be configured for one or more of 16 channels.

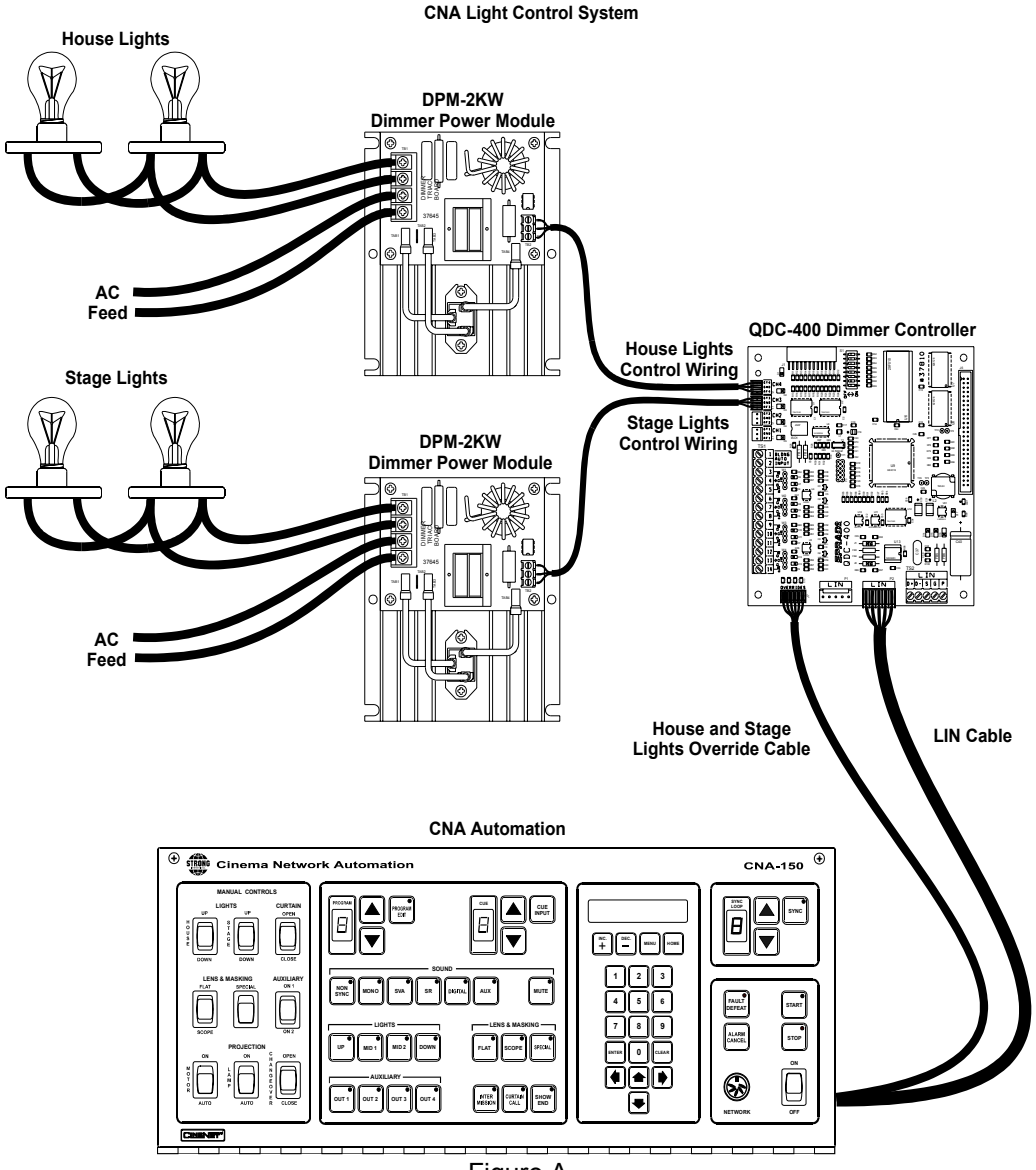


Figure A

QDC-400 Dimmer Controller

The QDC-400 is a computer controlled four channel light dimmer controller. The QDC-400 connects to the LIN (Local I/O Network) and receives it's set up parameters and commands from the CNA automation system. Light levels for each channel can be stored and recalled by the CNA automation program. Each level can be set from 0% to 100% in 1% increments. Each level also has a "Fade-In" time associated with it. The Fade-In time controls how long it takes the lights to ramp to a new level. The Fade-In time can be set from 0 to 99 seconds with 1 second resolution.

Theory of Operation

The QDC-400 Dimmer uses *phase-angle firing* to control the amount of power delivered to the lights. The "reference" signal is full wave rectified AC from the transformer on the DPM-2KW power module. The reference signals RF 1 through RF 4 provide a power line zero crossing timing reference. The sine wave is squared up with zero-cross detection circuitry. This signal goes high when the reference signal is nearly at ground, which corresponds to the zero crossing of the power line. The computer generates a pulse which sets the triac gate voltage. At the next power line zero-crossing the pulse resets the triac gate voltage. The output is buffered by the gate driver. Power to the QDC-400 is obtained from the reference signal.

The QDC-400 powers up with the lights off and then waits indefinitely for LIN (Local I/O Network) communications to be established. When the link is established to the CNA, the QDC-400 uses the "control record" received from the CNA Automation to ramp and set the light levels. In this mode the QDC-400 ignores it's Local Override Inputs and passes them on to the CNA. These inputs are pulse stretched to three seconds. The CNA then uses these inputs to force override states using it's own internal logic, which is sent back to the QDC-400 in the control record.

If communications is not established to the CNA, the rising edge of the Local Override Inputs are used to force the lights levels directly from the "saved" parameters which were validated on power up and possibly received from the CNA if the LIN link was ever established.

The Building Maintenance Override input is level activated. Although it's level is sent to the CNA, it is always used locally and has the highest control priority always overriding all other commands (including the control record from the CNA). It simply ramps all channels to 100% in 2 seconds. Releasing this input ramps the lights back to the latest control level in two seconds.
In the event that the LIN link has been established and subsequently lost the QDC-400 will "hold" it's current light levels indefinitely.

Figure B shows the CNA dimmer system interconnection diagram showing all input and output signals. The QDC-400 itself has numerous local override inputs for emergency manual control and I/O ports for future expansion.

QDC-400 Dimmer Control Board Functional Block Diagram and System Interconnection

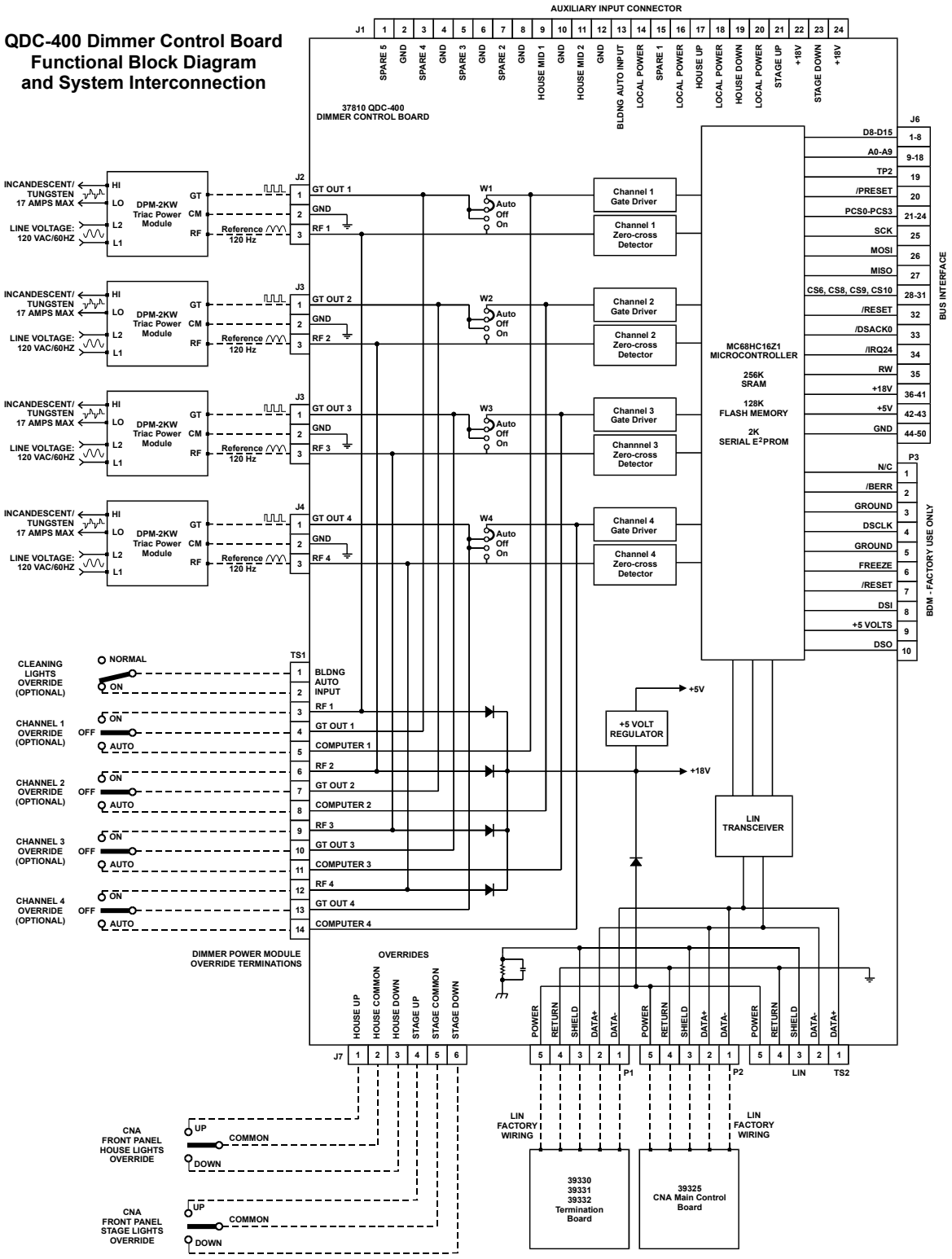


Figure B

Features:

Auxiliary Input Board Connector: This connector supports a secondary input board necessary for non-CNA applications.

DIP Switches: Used for configuration options. S1-1 through S1-6 are undefined. S1-7 and S1-8 assign the board an Id number.

Firmware: This chip contains the application software.

Bus Interface: This connector supports QDC-400 expansion boards.

Status LED: The Status LED on this board indicates computer and communications status.

QDC-400 Dimmer Control Board

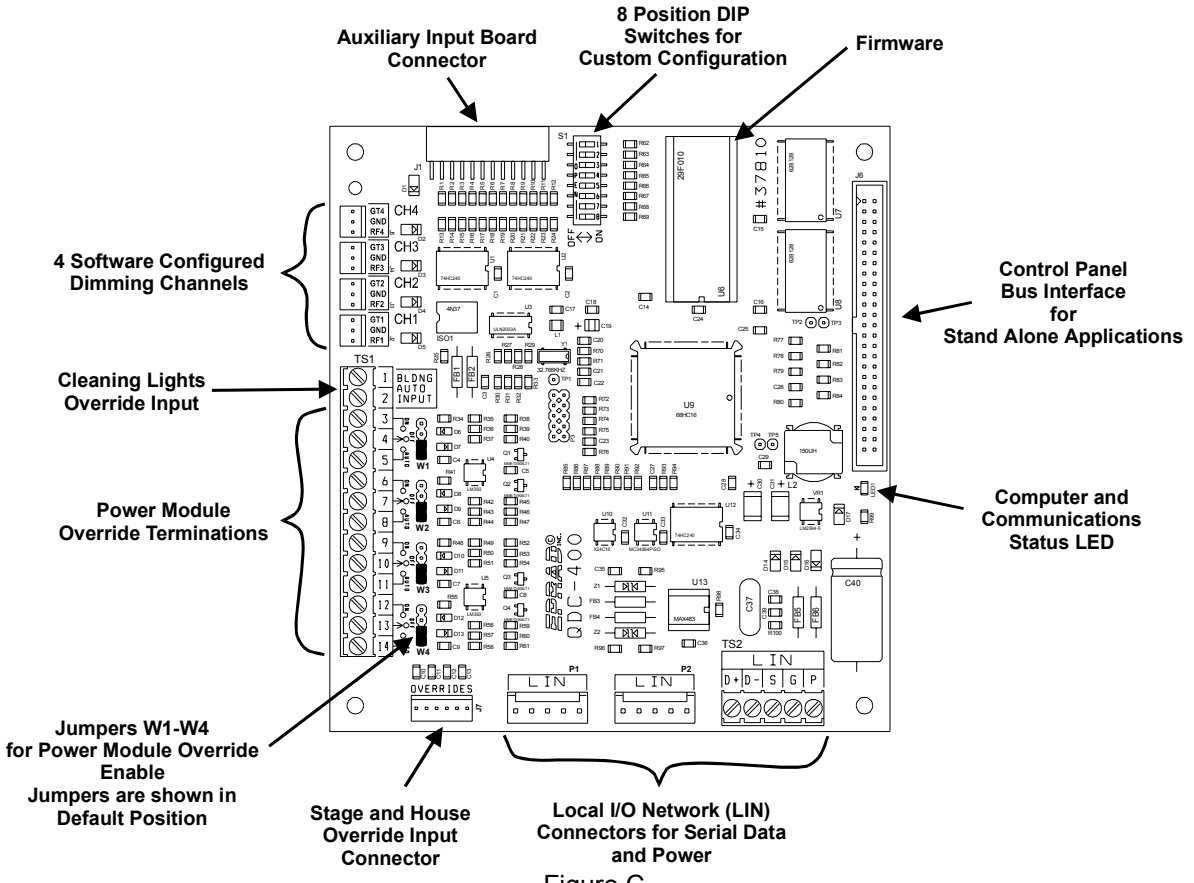


Figure C

LIN Connectors: The three Local I/O Network connectors are wired in parallel. P1 and P2 connectors are for factory supplied cables and TS2 is used for field wiring if necessary.

Jumpers W1 through W4: These jumpers are used to enable the DPM-2KW override switches (optional). If the override switches are not used, the jumpers must be in the AUTO position. If the override switches are used, the jumpers must be in the OFF position.

DPM-2KW Override Termination: The optional DPM-2KW override switches are wired to this terminal block. A three position switch will determine the light output: On, Off or Auto.

Cleaning Lights Override Input: When this input is made all channels will ramp to 100% in 2 seconds. When the input is released, all channels will ramp back to the last level in 2 seconds.

Dimming Channels: Four dimming channels are line phase independent. The channels can be independently configured for House or Stage lights.

DPM-2KW Dimmer Module

The DPM-2KW dimmer module contains an optically isolated triac, a high power triac and a small isolation transformer. The transformer is connected to the same power line as the lighting load, to obtain a line reference. The triac firing pulse from the QDC-400 is connected to an optically isolated triac. This triac is used to apply gate current to the high power triac. The RFI filter reduces the electrical noise generated by the phase angle firing of the power triac. The reference signal is full wave rectified AC from the transformer. It provides the zero crossing timing reference and power to the QDC-400.

37870 Dimmer Power Module
Functional Block Diagram

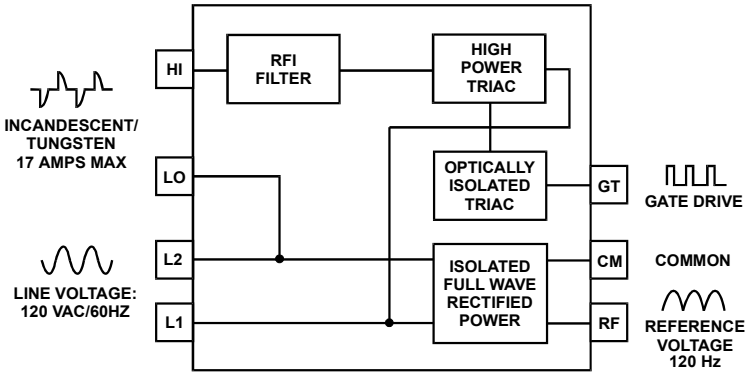


Figure D

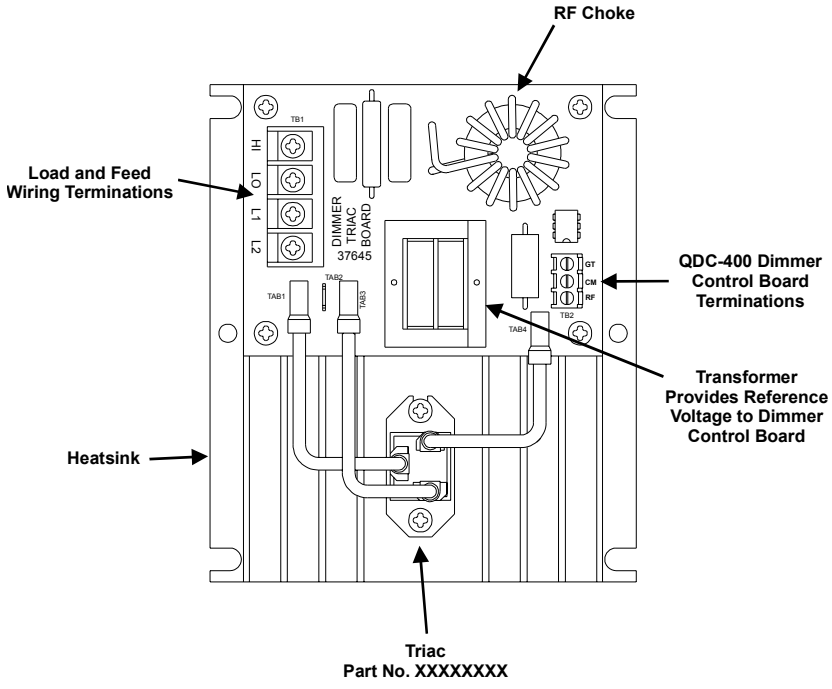


Figure E

QDC-400 Dimming Curve

The QDC-400 follows a level to output ratio called the “Square Law” dimming curve. It is an exponential relationship between percentage of light perceived and the percentage of light measured. The Square Law curve is a presumed relationship between perceived illuminance and measured illuminance. The theoretical Square Law dimming curve is shown below in Fig. F.

Figure F

The response at low light levels is smooth with no "spikes", "sags" or "dead travel". Light level output is continuous and flicker-free over the entire dimming range.

The Square Law Curve is given by the equation:

$$V_{out(RMS)}/V_{line(RMS)}=[V_{c(IN)}/V_{c(MAX)}]^{.592}$$

The RMS voltage of the triac controlled AC waveform is given by the equation:

$$V_{out(RMS)}=V_{line(RMS)}[1/\pi(\pi-\alpha+\sin 2\alpha/2)]^{.5}$$

where α is the delay angle expressed in radians. Substituting $V_{out(RMS)}$ into the Square Law equation and solving for $V_{c(IN)}$ gives the equation:

$$V_{c(IN)}=V_{c(MAX)}[1/\pi(\pi-\alpha+\sin 2\alpha/2)]^{.845}$$

$V_{c(IN)}$ x 100 is the dimmer set point expressed as a percentage.

A table with the one hundred set points is generated from these equations. Each set point and it's corresponding output RMS value are shown below for a 120 volt input. This table may aide the technician in setting up light levels and can be used to calculate power consumption if necessary.

Set Point	Output
0%	0.0 $V_{(RMS)}$
1%	7.86 $V_{(RMS)}$
2%	11.84
3%	15.05
4%	17.85
5%	20.37
6%	22.69
7%	24.86
8%	26.90
9%	28.85
10%	30.70
11%	32.49
12%	34.20
13%	35.86
14%	37.47
15%	39.03
16%	40.55
17%	42.03
18%	43.48
19%	44.90
20%	46.28
21%	47.64
22%	48.97
23%	50.27
24%	51.55
25%	52.82
26%	54.06
27%	55.28
28%	56.48
29%	57.67
30%	58.84
31%	59.99
32%	61.13
33%	62.25
34%	63.36

Set Point	Output
35%	64.46
36%	65.54
37%	66.61
38%	67.67
39%	68.72
40%	69.76
41%	70.79
42%	71.80
43%	72.81
44%	73.81
45%	74.80
46%	75.78
47%	76.75
48%	77.71
49%	78.66
50%	79.61
51%	80.55
52%	81.48
53%	82.40
54%	83.32
55%	84.23
56%	85.14
57%	86.03
58%	86.92
59%	87.81
60%	88.68
61%	89.56
62%	90.42
63%	91.28
64%	92.14
65%	92.99
66%	93.83
67%	94.67
68%	95.51
69%	96.33

Set Point	Output
70%	97.16 $V_{(RMS)}$
71%	97.98 $V_{(RMS)}$
72%	98.79 $V_{(RMS)}$
73%	99.60 $V_{(RMS)}$
74%	100.41
75%	101.21
76%	102.01
77%	102.80
78%	103.59
79%	104.37
80%	105.15
81%	105.93
82%	106.70
83%	107.47
84%	108.23
85%	108.99
86%	109.75
87%	110.50
88%	111.25
89%	112.00
90%	112.74
91%	113.48
92%	114.22
93%	114.95
94%	115.68
95%	116.41
96%	117.13
97%	117.86
98%	118.57
99%	119.29
100%	120.00

The values in the previous table are theoretical values. The rms output voltage is based on a nominal 120 vac input. Actual measurements may vary 1 or 2 volts on a true RMS meter.

The QDC-400 applies a similar table of one hundred points and linearly interpolates all points in between to a 16-bit resolution providing extremely smooth ramping from level to level.

Installation

The DPM-2KW power module will either be located in a Strong console system or in a wall mount cabinet. All power modules are shipped from the factory with a bypass jumper. Do not remove this jumper until all load wiring has been checked for opens and shorts. Be sure to turn off the circuit breaker or remove the main fuse from the power line before doing any work.

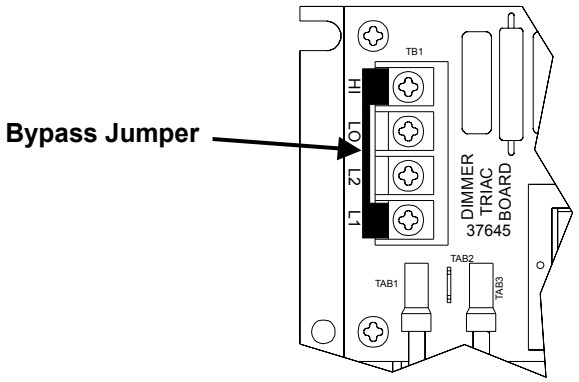


Figure G

Note: Before removing bypass jumpers be sure all circuit breakers are off.

The DPM-2KW is available for 120Vac/60Hz or 230Vac/50Hz operation. Please consult the factory.

Installation Guidelines

Strong automation and dimmer systems are microprocessor based theatre products. Field installations over the past several years have indicated that common wiring practices vary by region and by installation. For this reason, a set of guidelines which will assist with the successful installation of the Strong's computer equipment is listed below.

Microcomputers by their very nature, are susceptible to noise and power supply fluctuations. While these products were designed to function in a noisy environment and survive poor installations, it is to the benefit to the end user that these guidelines be followed.

The items listed below are the result of 25 years of industrial experience and are common, accepted practice for the installation of industrial microcomputers. The cost of implementing is minimal while their benefit is immeasurable.

1. Inspect the product for shipping damage immediately upon receipt. In the event of damage, file a claim with the carrier immediately.

2. Verify that all the relays are seated in their sockets and that all cables are firmly attached.

3. Verify the proper jumper and DIP switch configurations.

4. Verify that the power supply is set for the correct line voltage.

5. Insure that all requirements of national and local electrical codes are satisfied during installation. Run *clean* power (dedicated to the computer systems only) to all automations from the service entrance panel or the closest branch panel. The line, neutral and ground wires should all run back to the main service panel (separate from all other loads). It is acceptable and preferred and preferred if all automations were run from a single distribution point.

   IMPORTANT NOTE: Do not connect the projector motors, changeovers, xenon rectifiers, dimmer power or other heavy or noisy loads to this circuit.

6. It is imperative that the automation have a **good ground**. This is important in terms of safety and performance. The automation has an interference filter for the AC inputs. The specific intent of the filter is to reduce the effect of interference (noise) on the AC line that provides power to the unit, by providing a "leakage" path to ground from the power lines.
   Important note: Unless an earth ground is provided this leakage can pose an electrical shock hazard.

   In new installations use a copper conductor (not the conduit) from the automation back to the service entrance ground. Connect all automations in the booth to this ground point. This arrangement is best and most reliable. If this is not practical, (such as a retrofit for example), provide the best "earth" ground possible.

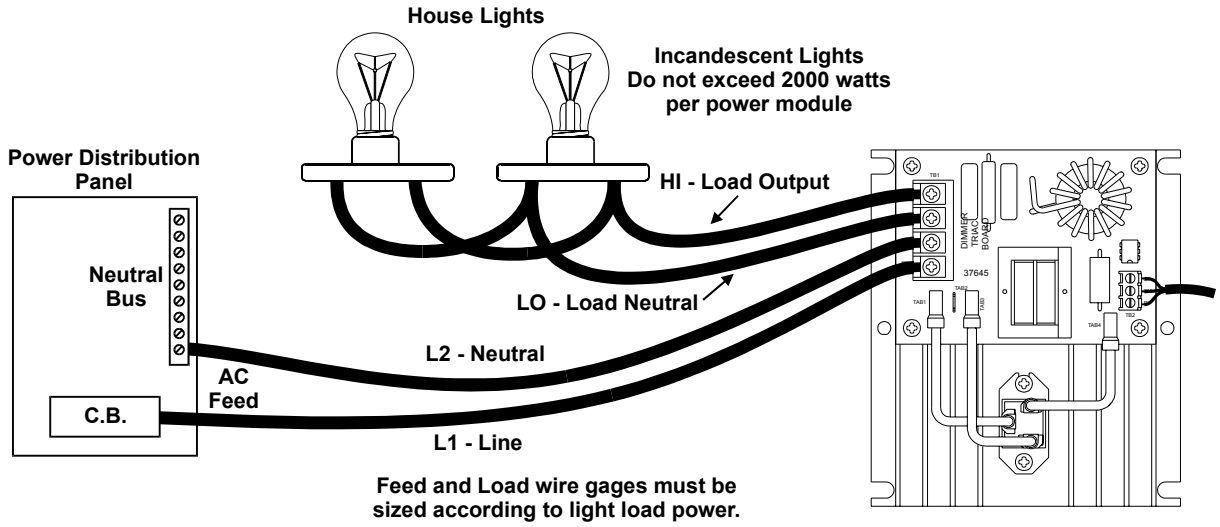
   A second best setup would be to run copper wire back to the ground lug in a branch panel.

   The minimum acceptable grounding method is conduit ground back to the branch box. In some installations satisfactory operation with this ground may not be possible.

7. Do not run the line voltage power wires in the same raceways as the low voltage signal wires. This is important from both a safety standpoint and a system reliability standpoint. It is best to keep the failsafe, cue detector, LIN, LSN, sound format and dimmer control wires separate from projector motor, changeover, xenon lamp, and other power carrying wires. If it is essential that they be run in the same duct, keep them separated in the duct.

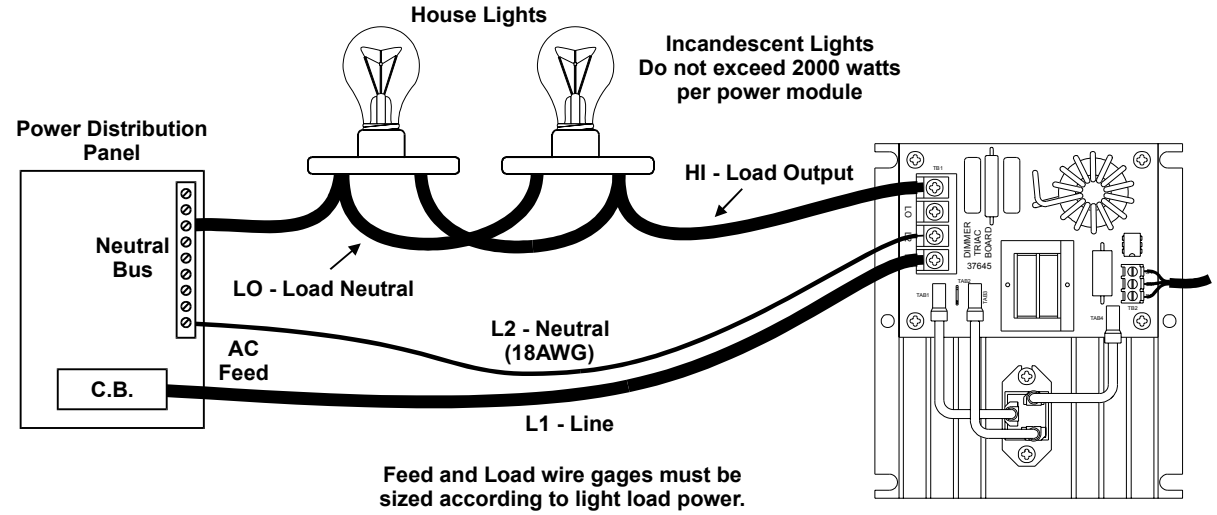
Load and Feed Wiring

There are two acceptable methods of wiring the DPM-2KW power modules to the lighting load. The first method involves wiring the return or neutral for the load and feed to the dimmer power module.



Method #1

The second method involves wiring the load return (neutral) to power distribution panel. A neutral connection is still required at the power module. Since this wire will not carry much current, 18 gage wire is appropriate.



Method #2

If the dimmer modules are mounted in a wall mount cabinet, determine the appropriate location for the unit. We recommend mounting it as close to the incoming power for the lights as possible. Since power and signal/control lines may provide excellent conduction paths for rfi or electrical noise, long unshielded wire may serve as efficient antennas. By minimizing the distance you are running the larger feed cables you are reducing the chance of erratic behavior. You may also want to consider keeping them at least six inches away from any audio cables and equipment since thyristor power or control lines may permit electrical noise to be induced into these cables. Entering the cabinet, you should have an appropriately sized supply or feed line. The supply line should be connected to the dimmer module terminals identified as L1 and L2. L1 being the Line wire and L2 being the neutral wire. The cabinet should be properly grounded in accordance to local electrical code requirements. The load line for the lights is connected to terminal positions identified as HI and LO.

Typical House and Stage Lights Wiring

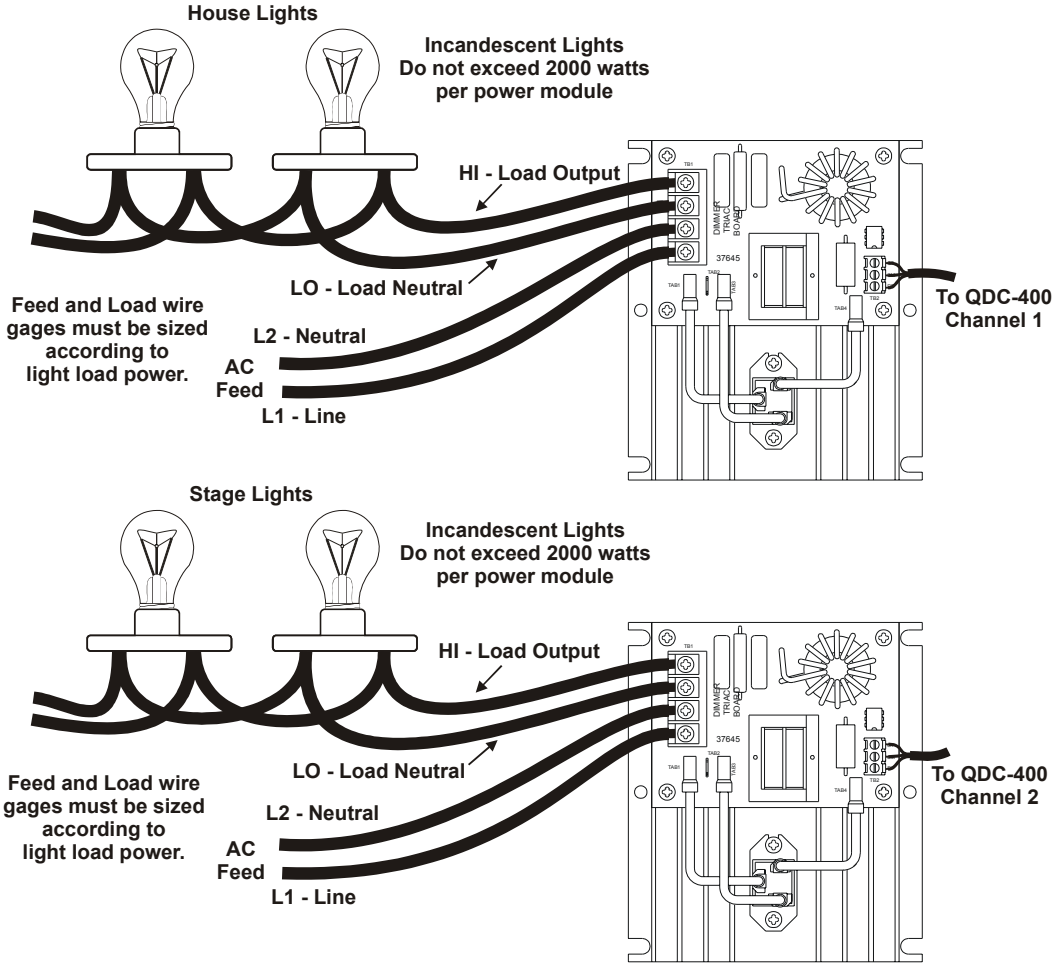


Figure H

The drawing above depicts a typical 2 channel house and stage lights configuration. The house lights are controlled from channel 1 of the QDC-400 dimmer control board and the stage lights are controlled from channel 2. Remember not to exceed the power module rating.

Each dimmer module contains a transformer connected to the same power line as the lights, which is used as a line reference for the QDC-400. Since the house and stage lights are on different QDC-400 channels, they can be powered from different power line phases. This allows the installer to balance the lighting loads between power line phases.

Parallel DPM-2KW Modules

When more than 2000 watts of power are required for the lights circuit the DPM-2KW dimmer modules can be paralleled. (This will only be necessary if all four QDC-400 channels are full.) This is accomplished by wiring the COMMON and GATE terminals between the two modules. Do not connect a wire between the REFERENCE terminals.

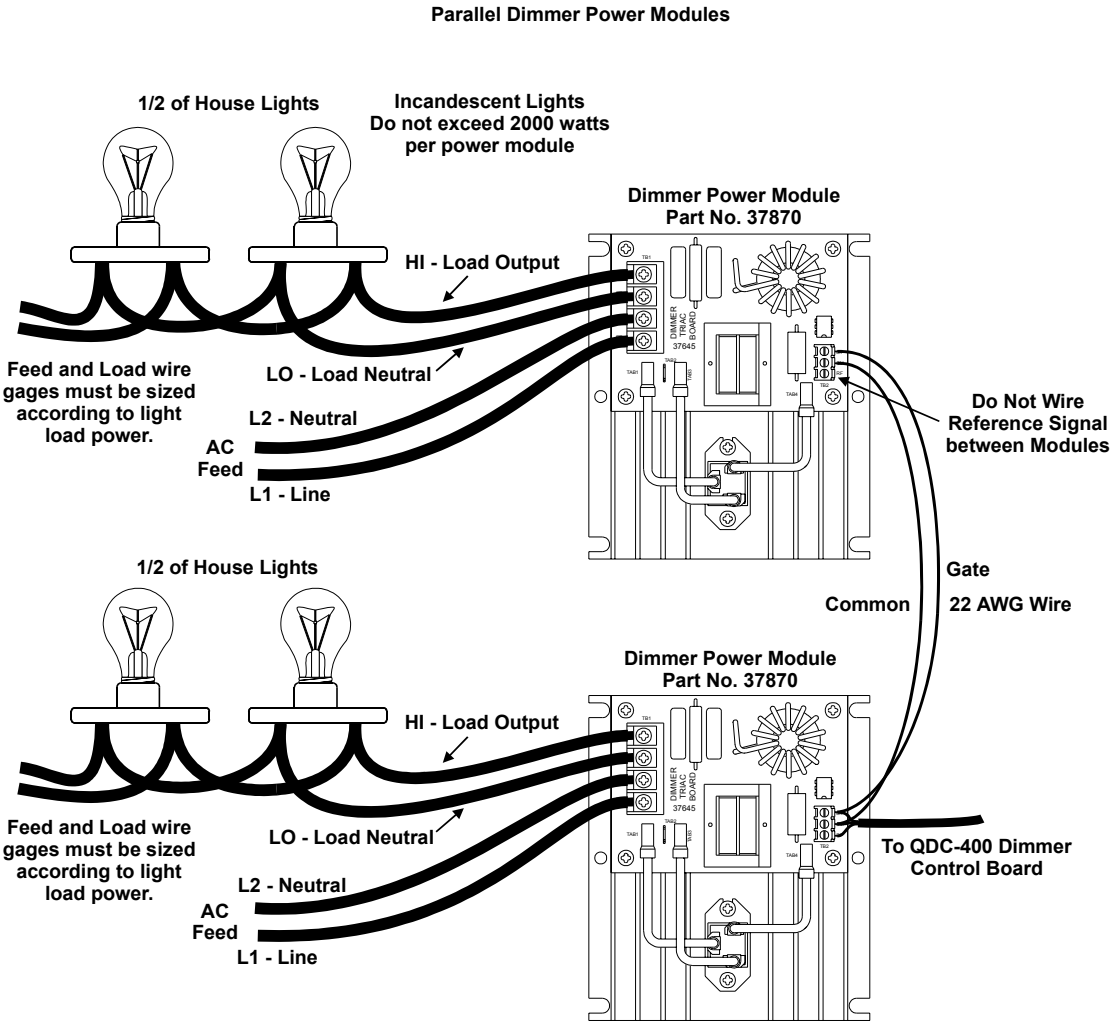
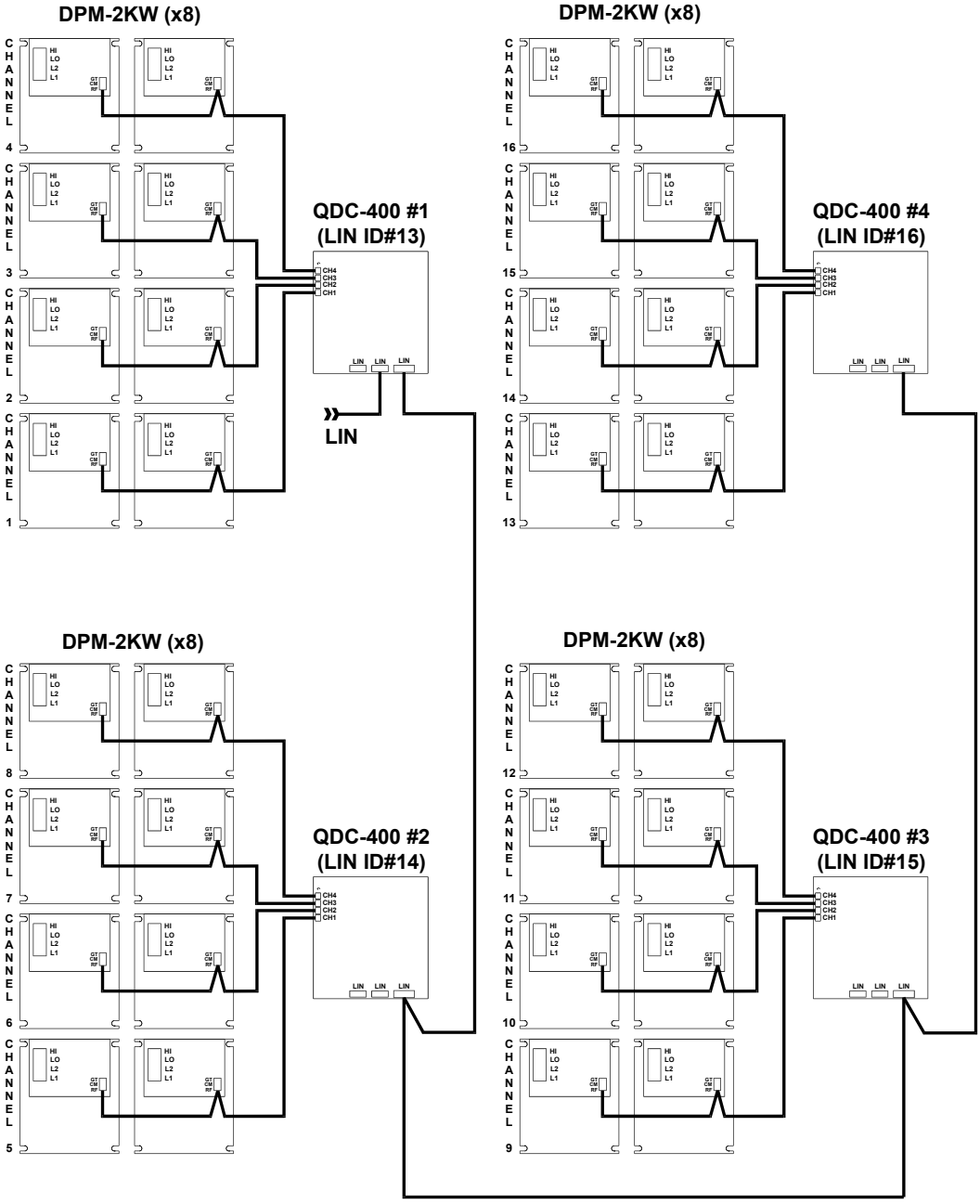


Figure I

Important: When modules are operating in parallel, the AC feed for both modules must be on the same power line phase.

Multiple QDC-400 Control Boards

The CNA automations can support up to four QDC-400 control boards. Each QDC-400 can drive four channels of up to 4000 watts. The drawing shows the dimmer system at maximum capacity. Any of the 16 channels can be configured for any of 16 pre-defined zones.



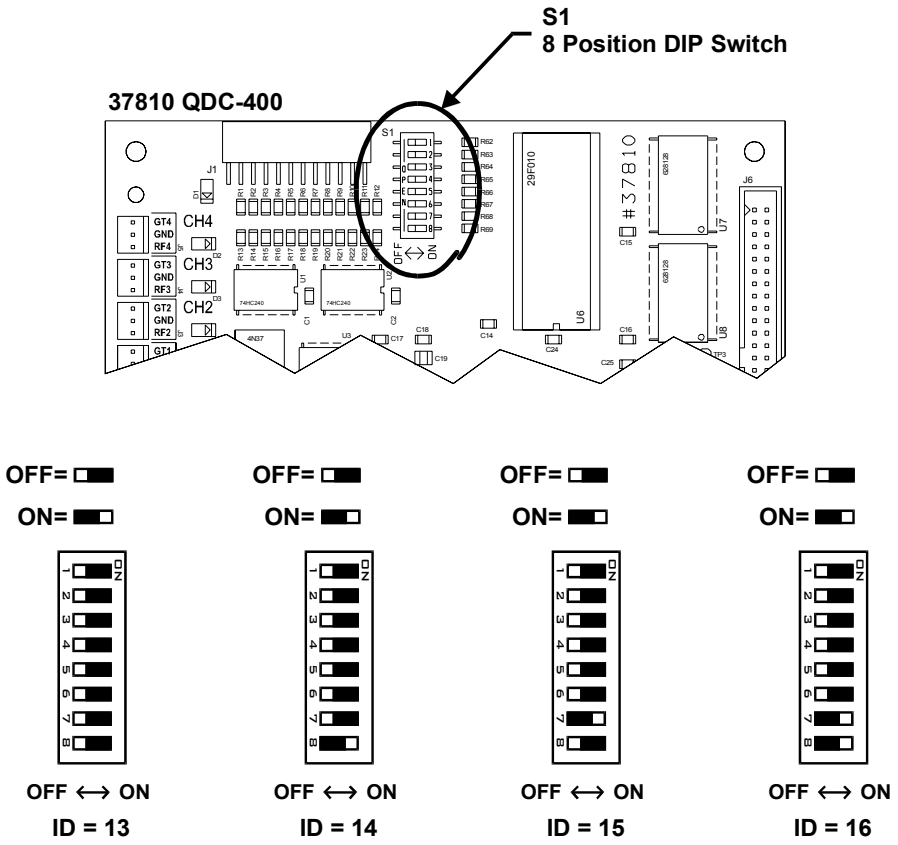
16 channels at 4000 watts per channel

Figure J

When using more than one QDC-400 the Id number must be configured on each board with the S1 DIP switch.

DIP Switch Configuration

The CNA Local I/O Network (LIN) can support up to 32 devices. Each of these devices requires a unique Id number. Ids 13 through 16 are reserved for the QDC-400 control board. The Id must be set correctly to operate properly.



S1-7 and S1-8 determine the Id number

Figure K

The Id number determines which channel configuration or control record data the QDC-400 will use. Id 13 is dimmer card 1 and only cares about the "control record" for channels 1, 2, 3, 4. Id 14 is dimmer card 2 and only cares about the "control record" for channels 5, 6, 7, 8. Id 15 is dimmer card 3 and only cares about the "control record" for channels 9, 10, 11, 12. Id 16 is dimmer card 4 and only cares about the "control record" for channels 13, 14, 15, 16

Bypass Jumpers and Channel Override Switches

These jumpers are used only in conjunction with the (optional) channel override switches. Channel override switches are used to circumvent the electronic circuitry in the event of a QDC-400 control board failure. If channel override switches are not used the jumpers must be in the "AUTO" position. If the override switches are wired to the TS1 terminals, the jumpers must be in the "OFF" position.

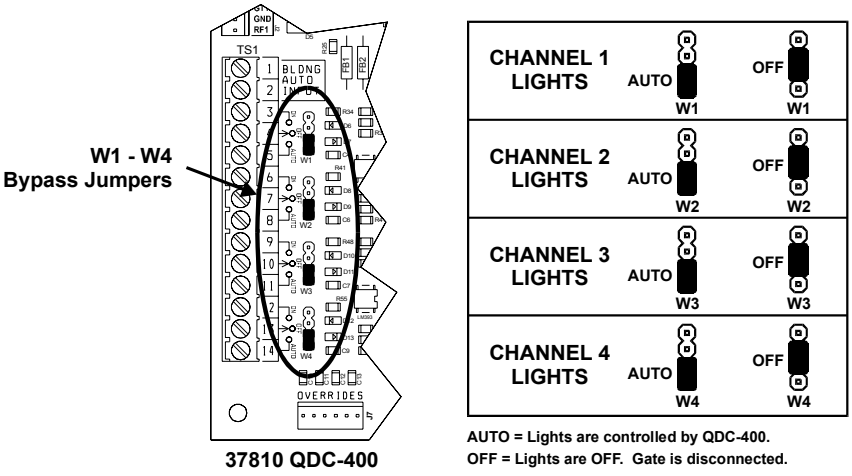


Figure L

The QDC-400 provides override inputs for emergency or manual control. A special function activated with the "Building Automation Input" is used to bring all channels to their maximum level. All fade-in times are bypassed. This input can be used to override the auditorium lights for cleaning, or (if fire codes permit) be connected to the fire alarm system. Also individual channel override inputs are provided. Each of channel can be wired to a "double-throw" switch allowing the manual control of the lights in the event of a board failure.

The channel override and cleaning lights switches are supplied by the user and should be mounted in a convenient location.

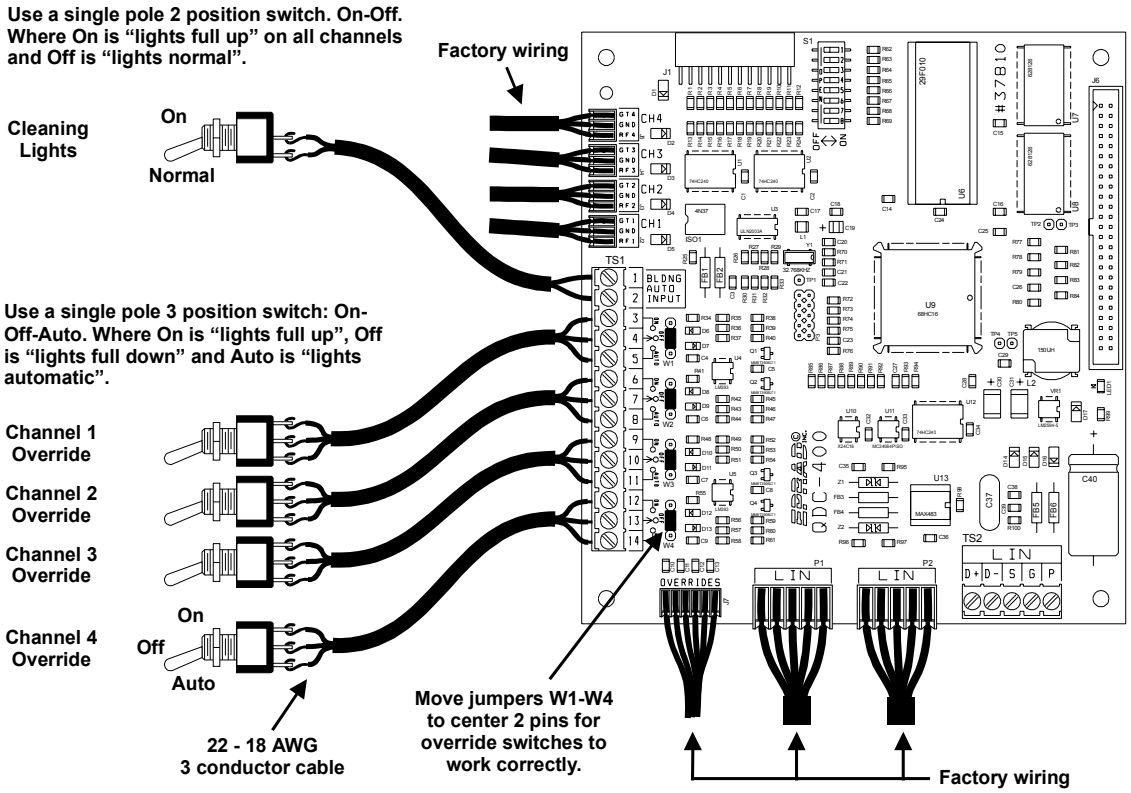

Use a single pole 2 position switch. On-Off. Where On is "lights full up" on all channels and Off is "lights normal".
Factory wiring
Cleaning Lights
On
Normal
Use a single pole 3 position switch: On-Off-Auto. Where On is "lights full up", Off is "lights full down" and Auto is "lights automatic".
Channel 1 Override
Channel 2 Override
Channel 3 Override
Channel 4 Override
On
Off
Auto
22 - 18 AWG 3 conductor cable
Move jumpers W1-W4 to center 2 pins for override switches to work correctly.
Factory wiring
TS1
BLDNG AUTO INPUT
OVERRIDES
P1
P2
LIN
TS2
D+ D- S G P
QDC-400

Figure M

Status LED

The Status LED located on the QDC-400 control board indicates 1 of 4 condition codes. The Status LED is located on the right side of the control board.

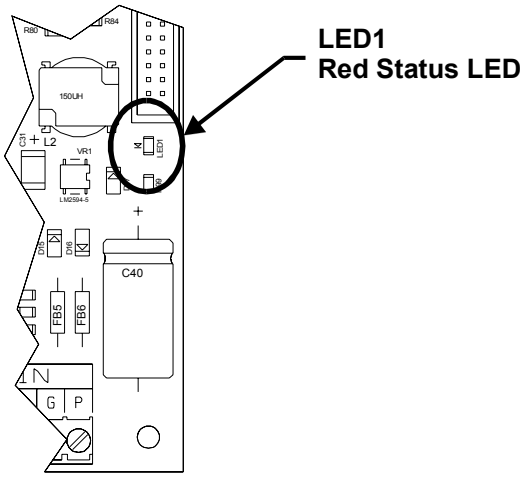


Figure N

Condition 1: *Fast Blink* - The QDC-400 computer is working and is communicating properly with the CNA.

Condition 2: *1 Blink On, Pause 2 seconds* - The QDC-400 computer is waiting for data from the CNA, and the outputs are disabled. This condition indicates that since a power up, the QDC-400 has not received data from the CNA. The lights are off and QDC-400 will wait indefinitely for communications to be established.

Condition 3: *2 Blinks On, Pause 2 seconds* - Communications Timeout, outputs are disabled. This condition indicates that communications were once established to the CNA and subsequently lost. The lights are off.

Condition 4: *3 Blinks On, Pause 2 seconds* - Communications Timeout, outputs are held. This condition indicates that communications were once established to the CNA and subsequently lost. The lights hold their current output level. The local Stage and House overrides will ramp outputs to the new level.

The following diagram shows the duration of the LED *off time* and LED *on time* for each condition.

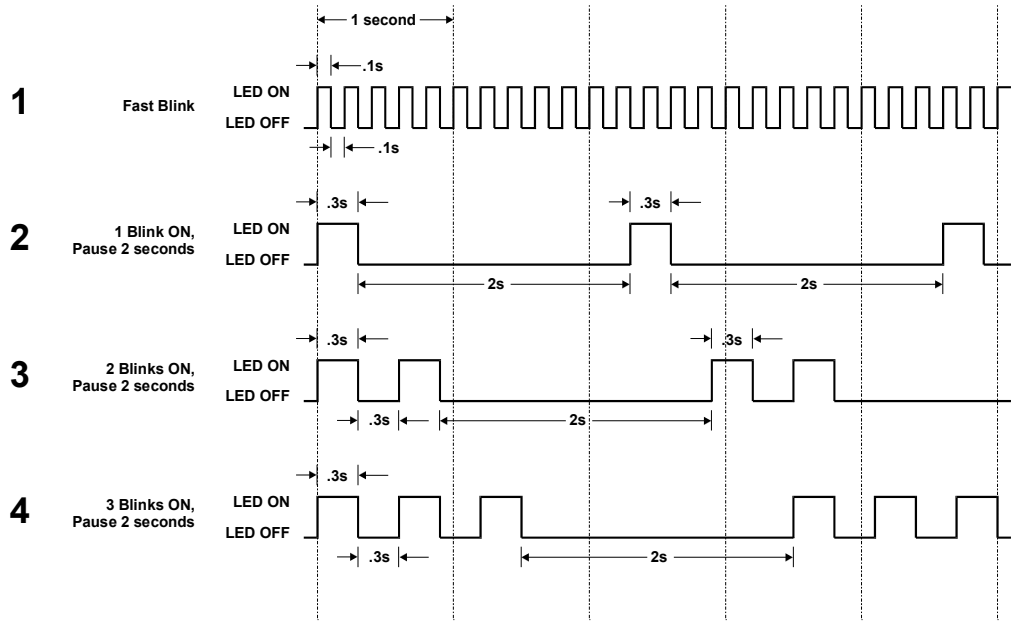


Figure O

Setup

CNA-150 Dimmer Setup

The CNA-150 and QDC-400 Dimmer Control board allow the user to quickly configure lighting scenes.

Note: Before beginning be sure the QDC-400 Control board, dimmer power modules and lights are wired and tested.

Enter the dimmer set-up screens by pressing [MENU][1][2] (or by pressing [MENU][ENTER][▼][ENTER]). Enter the password to gain access.

```
Dimmer
ENTER PASSWORD
```

The QDC-400 is a four channel dimmer and each channel must be appropriately set to either "House", "Stage" or "None". *Note: Any additional selections are only used for light show programs, which can only be programmed from the Host computer.* How these are configured will be determined by the physical wiring of the dimmer power modules and lights.

With the cursor on the channel field the press [+] or [-] keys to select the appropriate light zone. Repeat this for all channels and exit dimmer set-up to save zone data.

```
Dimmer Ch1=None
Up      0%   0 sec
```

Re-enter dimmer set-up by pressing [MENU][1][2].

But, before programming the levels and fade-in times you need to understand how the CNA-150 controls the House and Stage light zones. There are four *House* light levels that can be programmed from the front panel: UP, MID 1, MID 2 and DOWN. The *Stage* lights operate with the House lights as follows:

When programmed for:	The lights do this:
UP	:House Lights UP; Stage Lights UP
MID 1	:House Lights MID 1; Stage Lights DOWN
MID 2	:House Lights MID 2
DOWN	:House Lights DOWN;Stage Lights DOWN

A typical program might look like the following example:

Movie:	Program:	Lights:
Intermission	:UP	:House UP; Stage UP
Previews	:MID 1	:House MID 1; Stage DOWN
Feature	:DOWN	:House DOWN; Stage DOWN
Credits	:MID 2	:House MID 2
Intermission	:UP	:House UP; Stage UP

Based on the example above you could program the levels as follows:

House UP	= 80%	10 seconds
House MID 1	= 40%	10 seconds
House MID 2	= 40%	10 seconds
House DOWN	= 10%	10 seconds
Stage UP	=100%	10 seconds
Stage DOWN	= 0%	10 seconds

Note: You can ignore the Stage MID 1 and MID 2 levels. The CNA-150 does not currently use them.

CNA-200 Dimmer Set-up

CNA-200 software version 1.013 and the QDC-400 Dimmer Control Board is required for this procedure.

Note: Before beginning be sure the QDC-400 Control board, dimmer power modules and lights are wired and tested.

Enter the dimmer set-up screens by pressing [Set-up Dimmer] from the Set-up Supervisory menu. Enter the password to gain access.

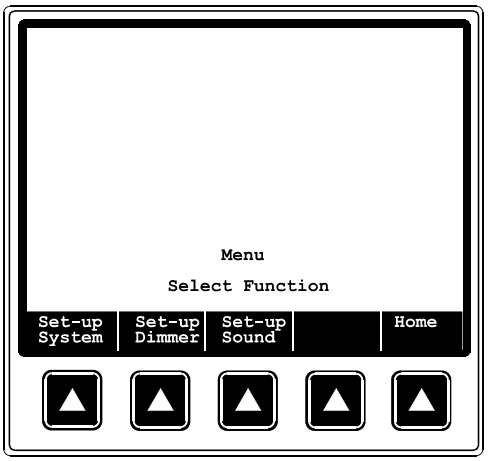


Figure 3.18: Press Set-up Dimmer.

Figure 3.19: Enter high level Password.

Each channel must be appropriately set to either “House”, “Stage” or “None”. *Note: Any additional selections are only used for light show programs, which are only available options on CNA’s with recent firmware.* How these are configured will be determined by the “physical” wiring of the dimmer power modules and lights.

The CNA-200 currently supports up to four QDC-400 Dimmer Control cards. The channels are assigned to the dimmer cards as follows:

Dimmer Card 1: Channel 1, 2, 3, 4
Dimmer Card 2: Channel 5, 6, 7, 8
Dimmer Card 3: Channel 9, 10, 11, 12
Dimmer Card 4: Channel 13, 14, 15, 16

With the cursor on the channel field, enter the number of the channel you want to edit or press the [Prev Page] and [Next Page] keys.

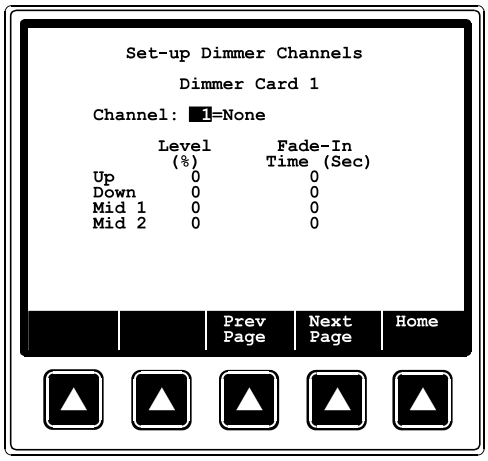


Figure 3.20: Select channel to edit.

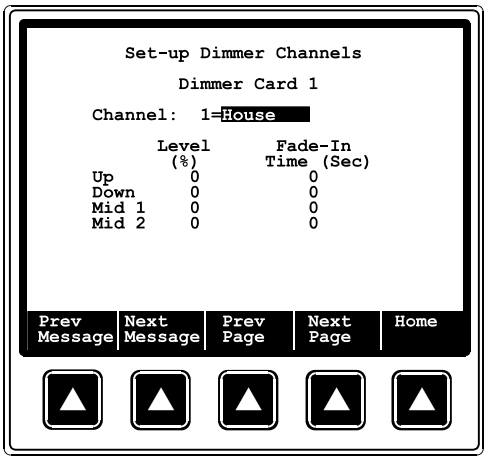


Figure 3.21: Select zone.

Scroll right to the "zone" field and select either House, Stage or None with the [Prev Message] and [Next Message] keys. This field contains a list of 16 zones and None (disabled). Two of the zones are defined as House and Stage. Currently the CNA-200 only supports the House and Stage zones. The selections in the list are as follows:

None	**ZONE 9 ✻**
House	**ZONE 10 ✻**
Stage	**ZONE 11 ✻**
ZONE 3 ✻	**ZONE 12 ✻**
ZONE 4 ✻	**ZONE 13 ✻**
ZONE 5 ✻	**ZONE 14 ✻**
ZONE 6 ✻	**ZONE 15 ✻**
ZONE 7 ✻	**ZONE 16 ✻**
ZONE 8 ✻	

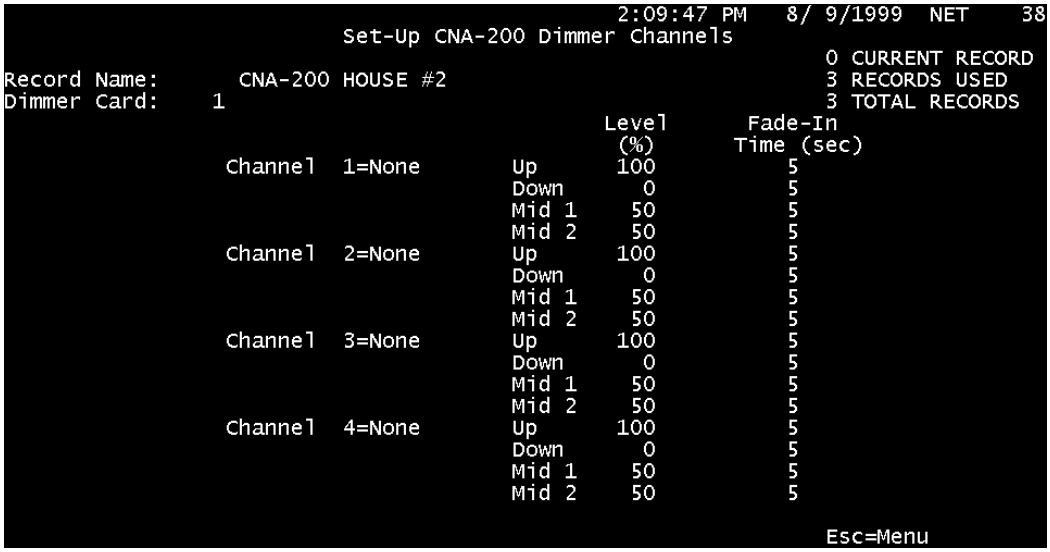
✻ Not supported by some older CNA-200 and QDC-400 firmware versions.

Use the cursor keys to move to the Level and Fade-In Time fields. Enter the desired values for each with the number keys. The fade-in time controls how long it takes the lights to ramp to a new level. Legal values for level are 0 to 100%. Legal values for fade-in time are 0 to 99 seconds.

Note: You can ignore the Stage Mid 1 and Mid 2 levels. The CNA-200 does not currently use them.

Host Dimmer Setup

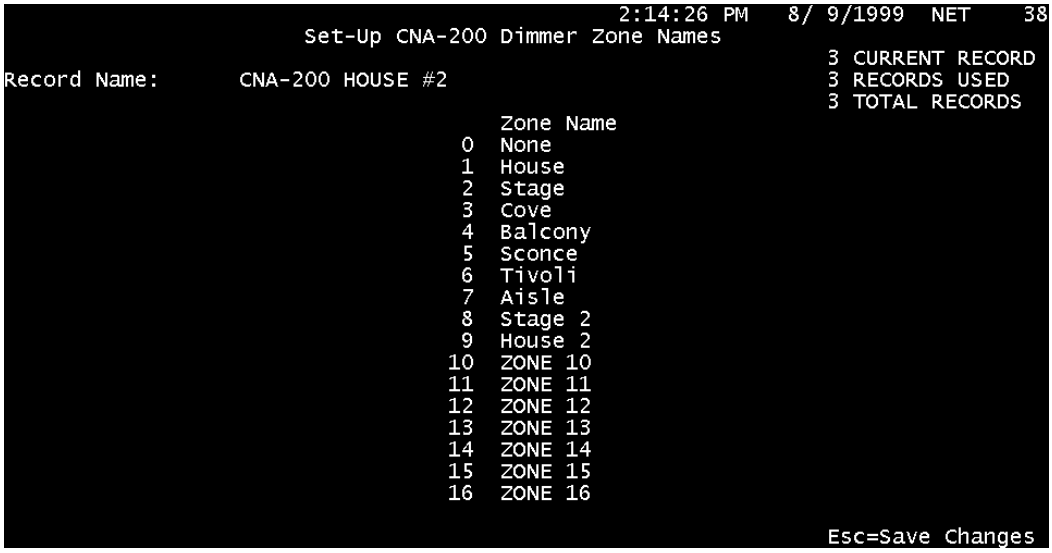
Dimmer parameters can also be entered from the Host program and copied to the individual CNA automations. This allows the user to configure all the dimmers in the complex from a central location. The dimmers in an entire theatre complex can be setup in minutes regardless of the number of screens. This will save hours of setup time. *Note: Host version 1.007 is required.*



Host Version 1.007 Channel Configuration screen.

The Dimmer Zone Names screen allows user to enter an 8 character name for Zones 3 through 16. This text will then show up at the CNA setup and program screens.

Note: This screen is for future use. Currently the CNA automation only supports the House and Stage zones.



Host Version 1.007 Zone Names screen.

Setup Hint:

The QDC-400 along with the DPM-2KW dimmer module can be used to extend bulb life. When set to the proper level, the dimmer can be used to preheat the lamp filaments at a point just below that required for incandescence. This makes it possible to avoid high initial current surges that result when power is first applied to an incandescent lamp because of the low resistance of the cold filament. The high inrush current exposes the bulb filament to stress that can cause premature filament rupture.

Normal Operation

The QDC-400 receives power from both the CNA automation and DPM-2KW Dimmer Modules.
The QDC-400 receives the light level commands from the CNA.

If the dimmer modules are powered up and the CNA is not, the lights will stay off until the CNA is powered up.

The dimmer manual override switches on the CNA front panel are connected directly to the QDC-400 and will control the lights up and down (even if the CNA is not powered up).

If the CNA loses power, the lights will hold their current state.

If power is re-established to the CNA, the lights will go to the power up defaults (house up, stage up).

CNA-100/150 soft overrides and program;

Key Press/Cue	Action
UP	:House Lights UP; Stage Lights UP
MID 1	:House Lights MID 1; Stage Lights DOWN
MID 2	:House Lights MID 2
DOWN	:House Lights DOWN; Stage Lights DOWN

CNA-200 soft overrides and program;

Key Press/Cue	Action
HOUSE UP	:House Lights UP
HOUSE MID 1	:House Lights MID 1
HOUSE MID 2	:House Lights MID 2
HOUSE DOWN	:House Lights DOWN

Key Press/Cue	Action
STAGE UP	:Stage Lights UP
STAGE DOWN	:Stage Lights DOWN

Software Changes:

Version:1.00
Checksum:227
Date:3/4/98

Software Written to support functions of QDC-400 Dimmer control.

Version:2.00
Checksum:230
Date:3/26/99

Revised code to improve operation. (Changed "BCLR OC1D,#$08" to "BSET OC1D,#$08" in OC1IRQ service routine.)

Version:3.00
Checksum:47
Date:4/26/99

Now allows Time of 0 seconds to support "change now" for light levels
Increased Dimmer maximum time from 60 to 99 seconds.
Added support for Dip Switch setting of LIN ID:

S1-7	S1-8	LIN ID
O	O	13
O	C	14
C	O	15
C	C	16

Added provisions for Dimmer channels to be configured for any 1 byte zone number. Channels configured for other than House or Stage do not support soft (overrides at the dimmer). Loss of Communications causes these channels to turn off.

Version:5.00
Checksum:57
Date:2/4/2000

Now supports LSN FLASH update Network commands The QDC-400's LSN Network address is the same as the CNA-100/150/200's LSN Physical Id it is connected to.
The QDC-400's LSN Logical Id is based on it's S1 DIP Switch setting

S1-2	S1-LIN	Id LSN	Logical Id
Off	Off 13	36	
Off	On 14	38	
On	Off 15	40	
On	On 16	42	

Version:6.00
Date:6/6/2000

When Running this Bootloader program, the CNA-150/200 and Host programs will show "DevErr" or "Wrong Device Type" on the LIN Network Status Screen. Also when

switching between Bootloader and Application programs the CNA-150/200 may experience a LIN Communications Fault (Since the communications are interrupted for a brief period). Asserting the Fault depends on the number of devices connected and the length of time it takes to the QDC-400 to switch programs. These messages and faults are normal and can (may) be expected when running the Bootloader

Version:8A
Checksum:77
Date:4/22/04

Improved noise immunity and made unit operate better with 50 Hz power line frequency
Dimmer screen now displays "transfer to CNA failed" message for 2 seconds rather than waiting for a second key to be depressed

BootLoader Changes:

Version:001
Checksum: 20
Date: 2/4/2000

Created Bootloader Program for the QDC-400

Version: 002
Checksum: 147
Date: 5/9/2000

Increased rate at which watchdog is toggled
Now Toggles watchdog in FL_Progbk routine

Version: 003
Checksum: 221
Date: 10/7/2002

Re-wrote FL_Erase routine, this allows full erasure of lettered AMD flash chipsets.

Version: 004
Checksum: 208
Date: 10/9/2003

Added support for front panel interface.

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